The age of the dark-toned floor unit in Jezero Crater

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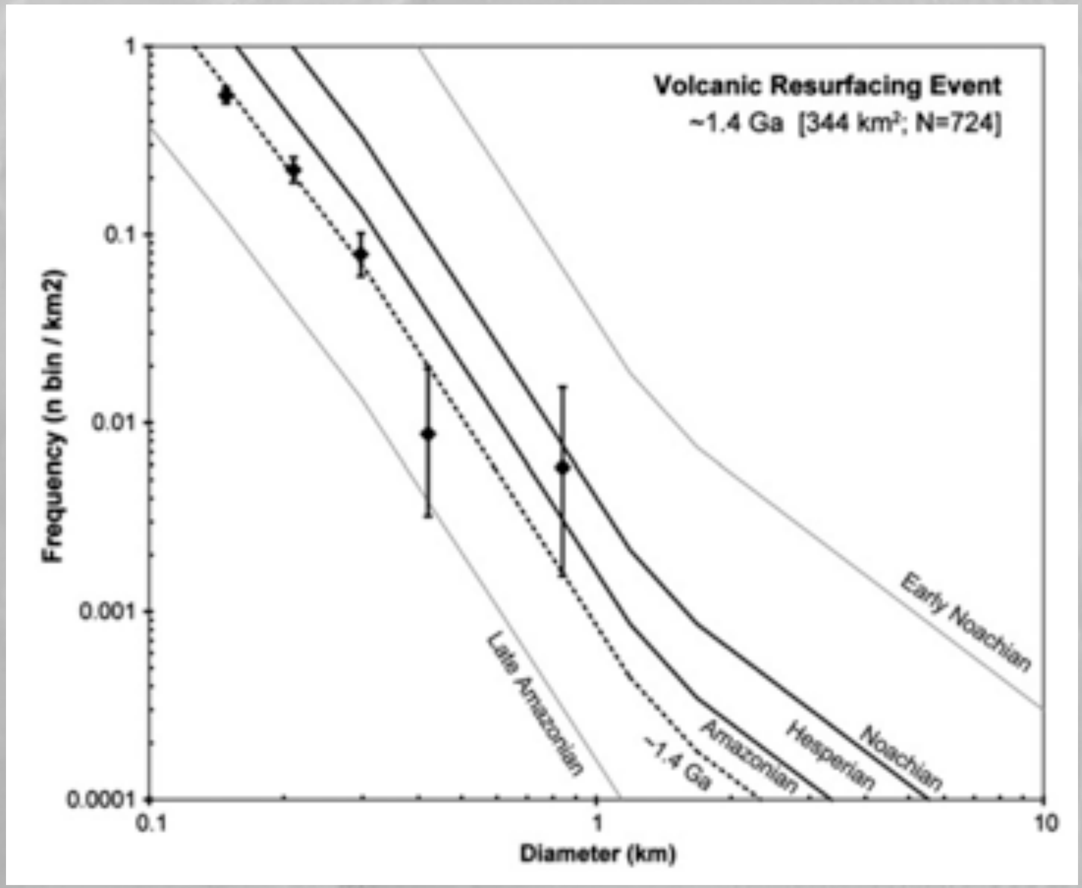
*On the Moon, **the samples obtained by the Apollo and Luna missions provide critical calibration points for cratering chronology**. On Mercury, Venus, and Mars, there are no similarly firm anchors for cratering rates, but chronology models have been established by extrapolating from the lunar record or by estimating their impactor fluxes in other ways.*

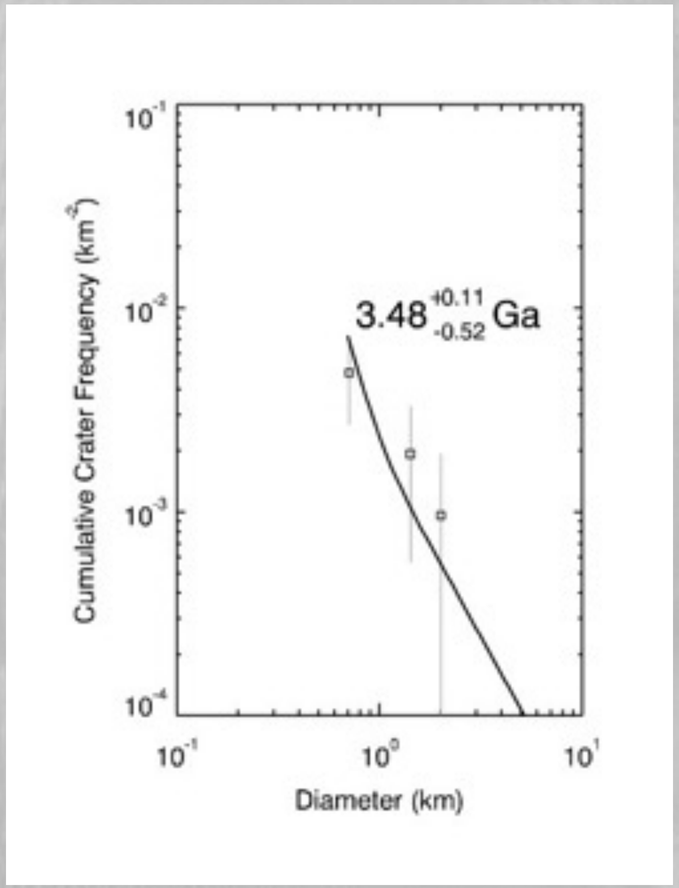
…

*In summary, it is obvious that **the most important measurements for improving our understanding of cratering rates in the inner solar system are additional direct age measurements of rocks from units whose crater statistics can be determined**. This statement holds for Mars, Mercury, and Venus and for additional locations on the Moon.*

Fassett, C. I. (2016), Analysis of impact crater populations and the geochronology of planetary surfaces in the inner solar system, J. Geophys. Res. Planets, 121, 1900–1926, doi:10.1002/2016JE005094.

What do we know about the crater-count age of the dark-toned unit ?



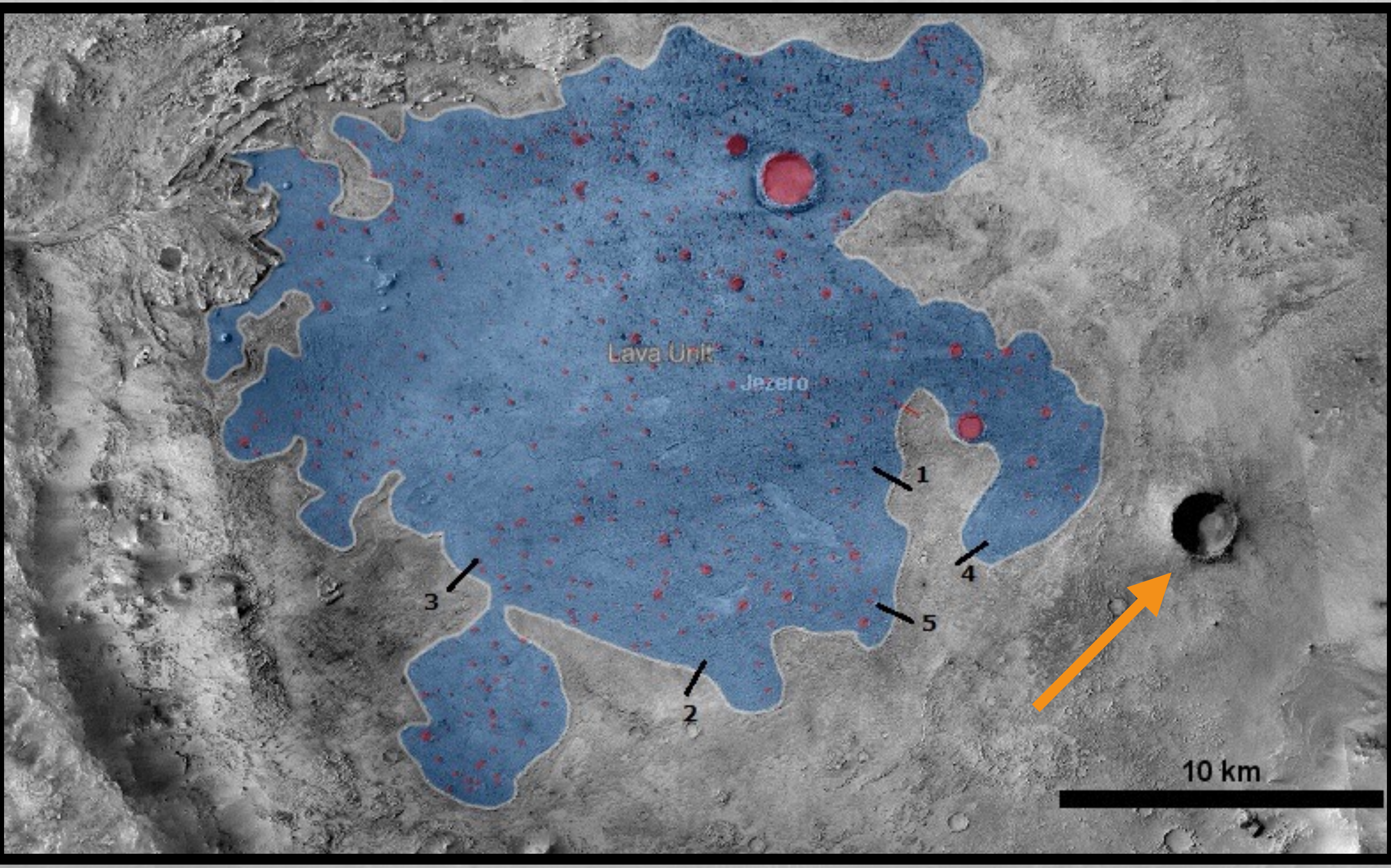


1.4 Ga (>200 m, Hartmann)

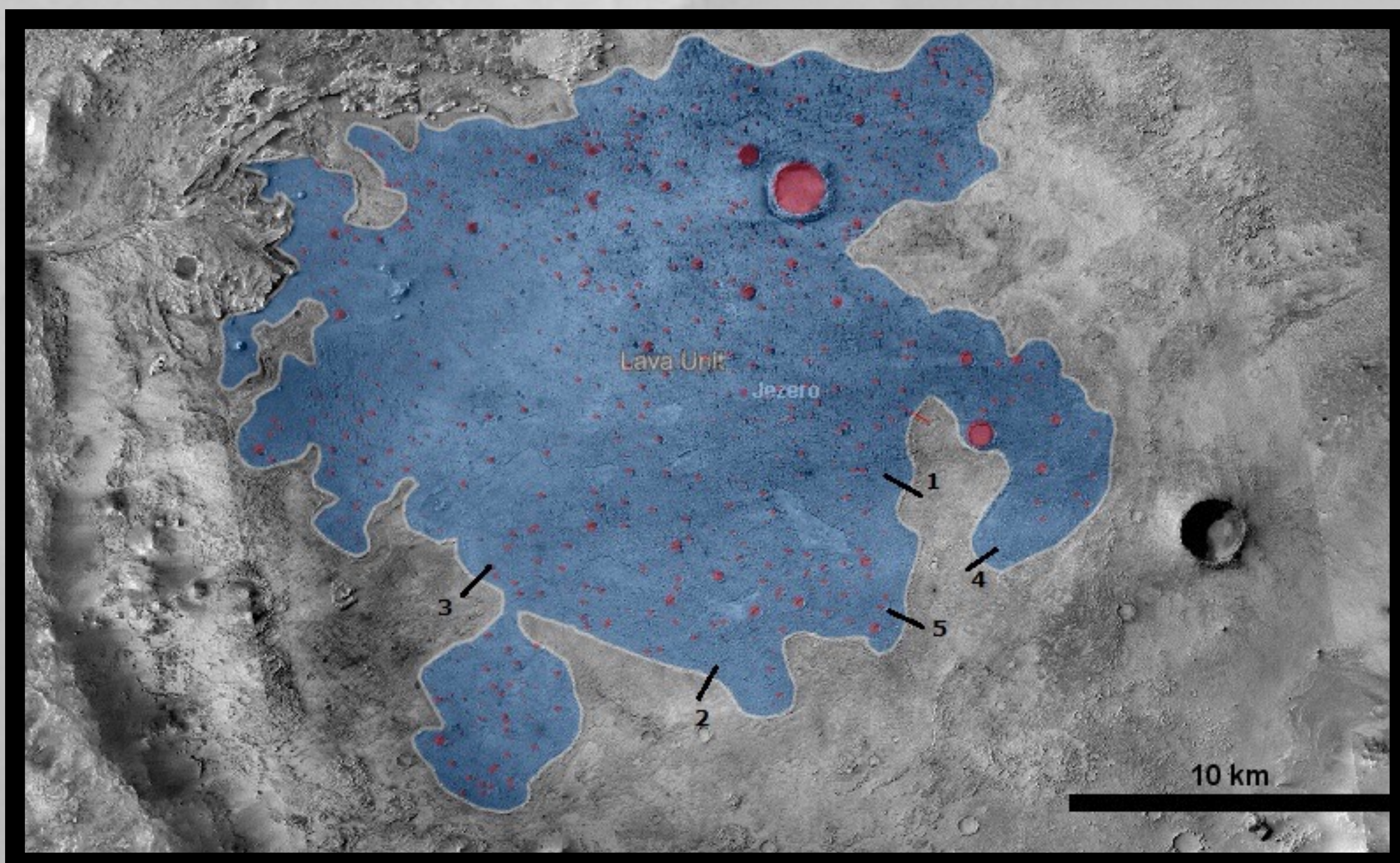
Schon et al, PSS, 2012

3.48 Ga +0.11/-0.52
(>700 m, Hartmann)

Goudge et al, JGR, 2012



Lava Unit
Jezero
1
2
3
4
5
10 km



Lava Unit
Jezero
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2
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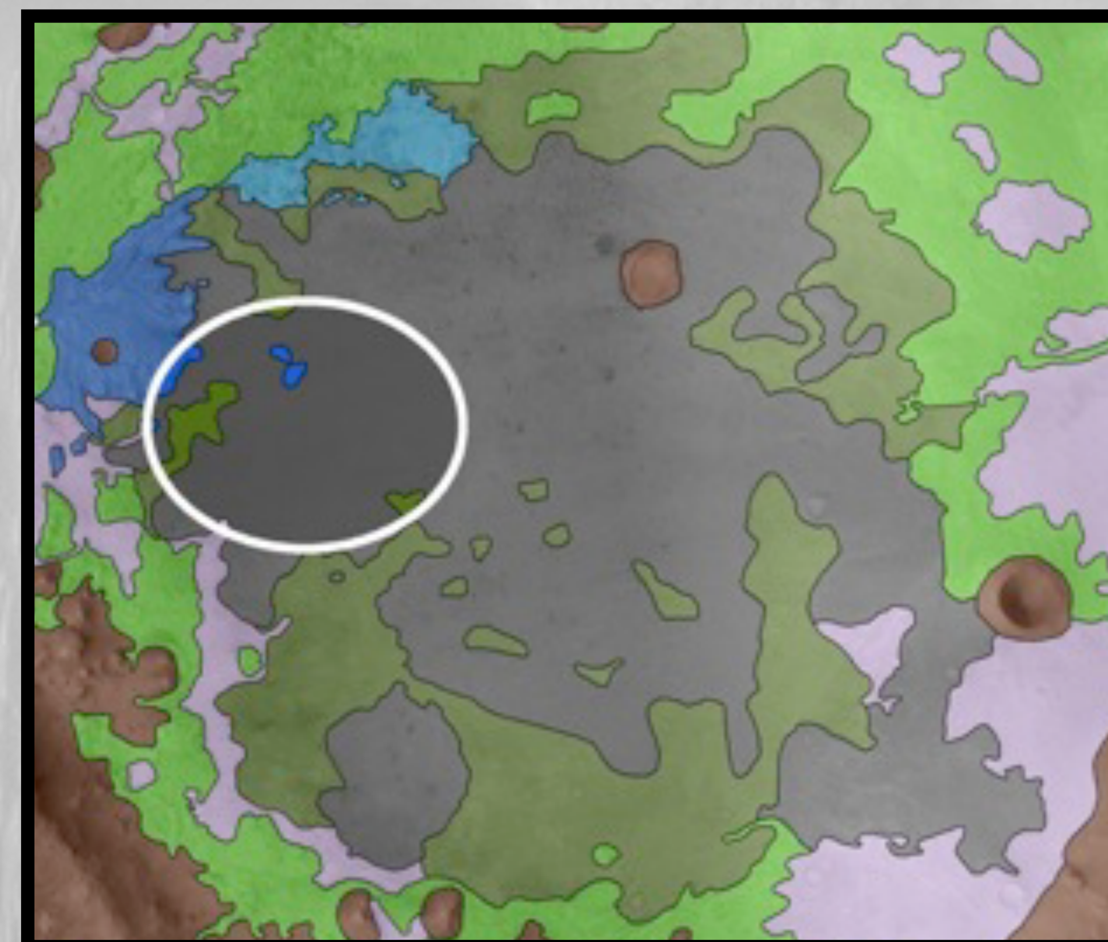
4
5
10 km



Rough estimate of unit thickness

Locatio n	Difference in elevation (Thickness)
1	32 m
2	23 m
3	31 m
4	23 m
5	10 m

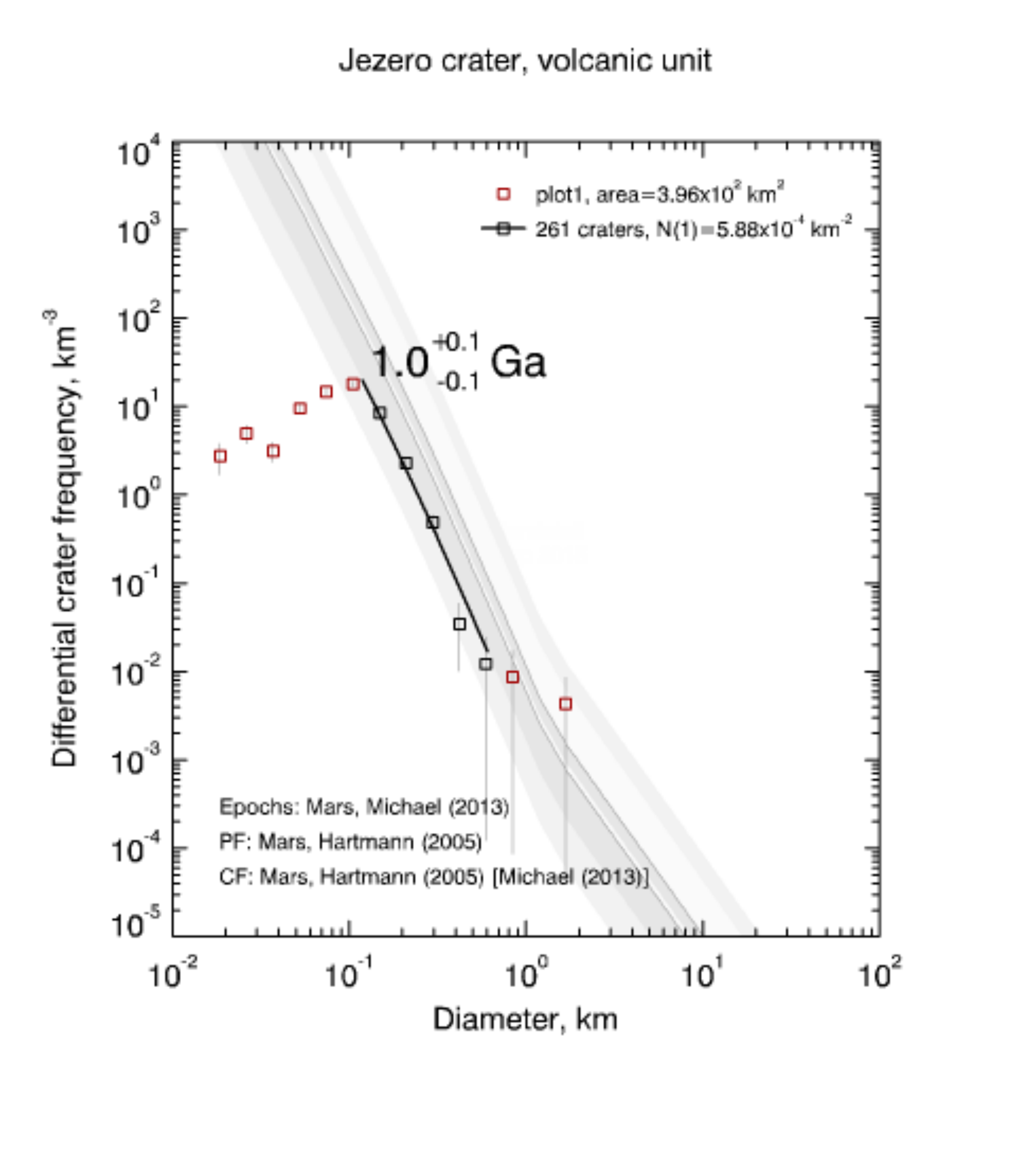
23.8 m +/-4

Simple craters: Rim height = 4% of diameter

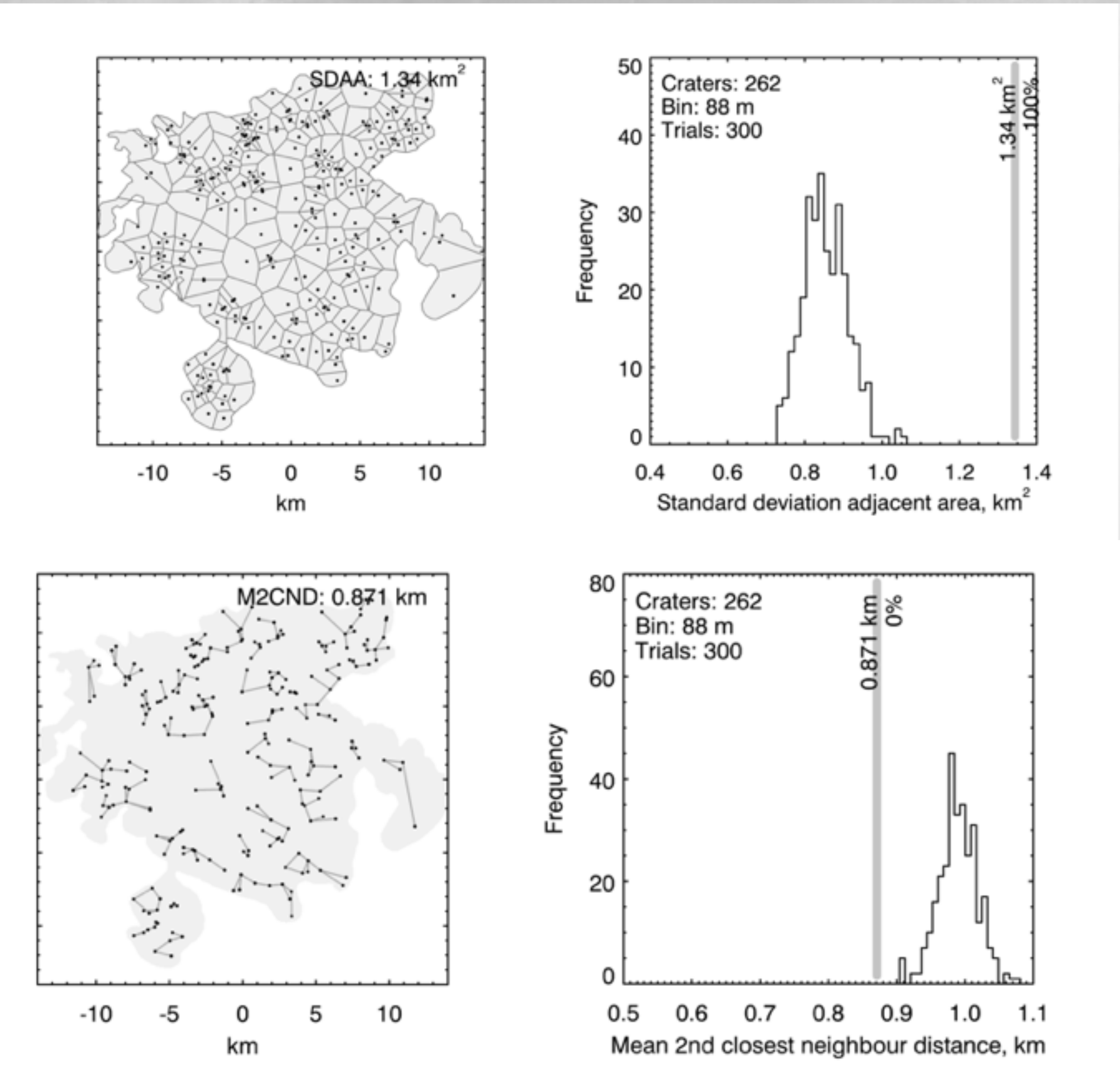
23.8 m +/-4 is equivalent to 595 m +/- 100 m

So: Craters above ~600 m diameters are suspect

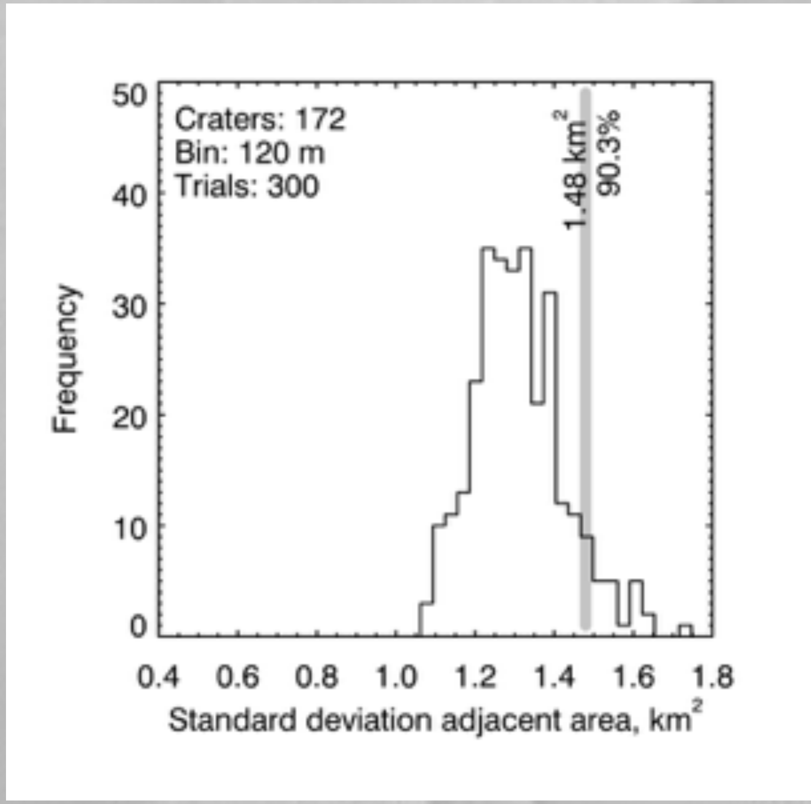
Age derivation

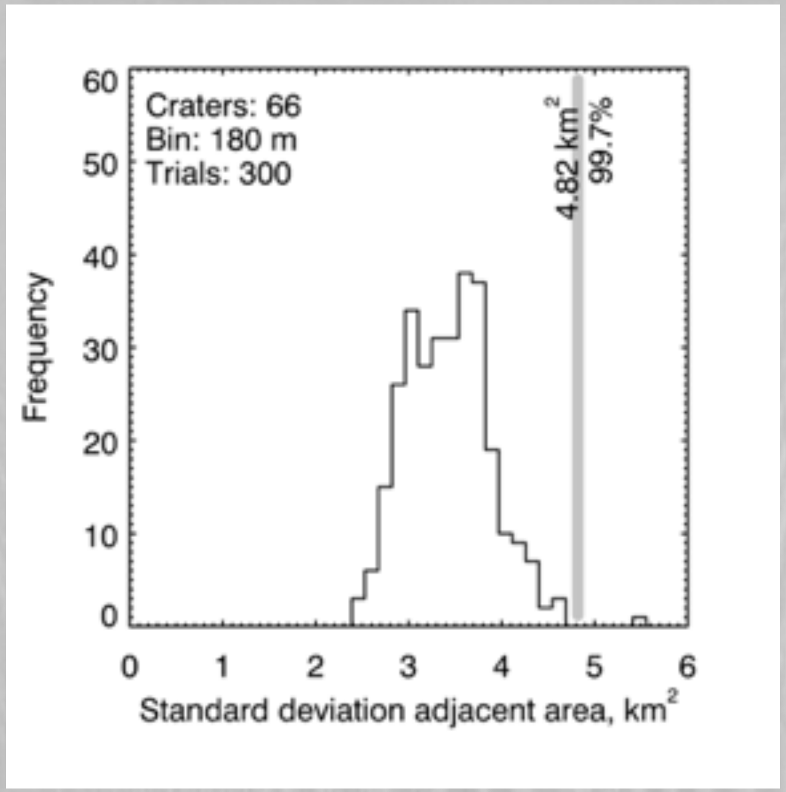


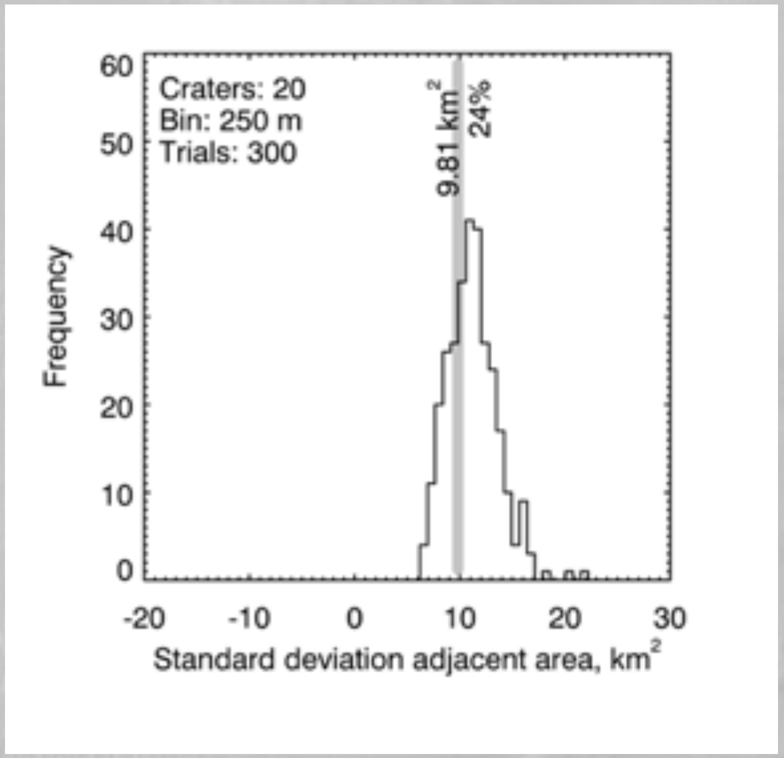
Randomness analysis

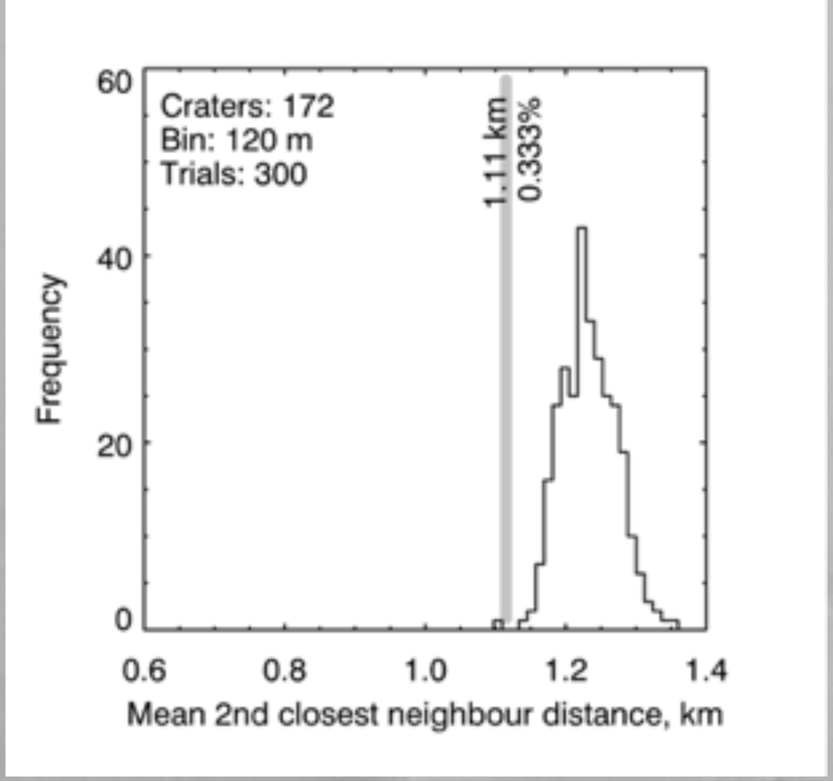


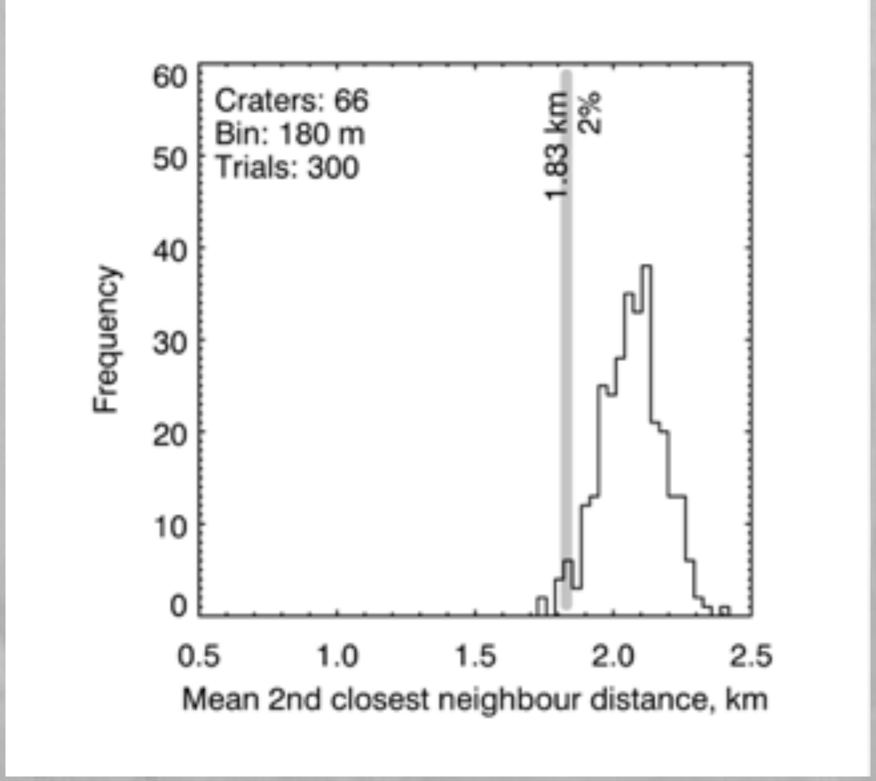
Randomness analysis

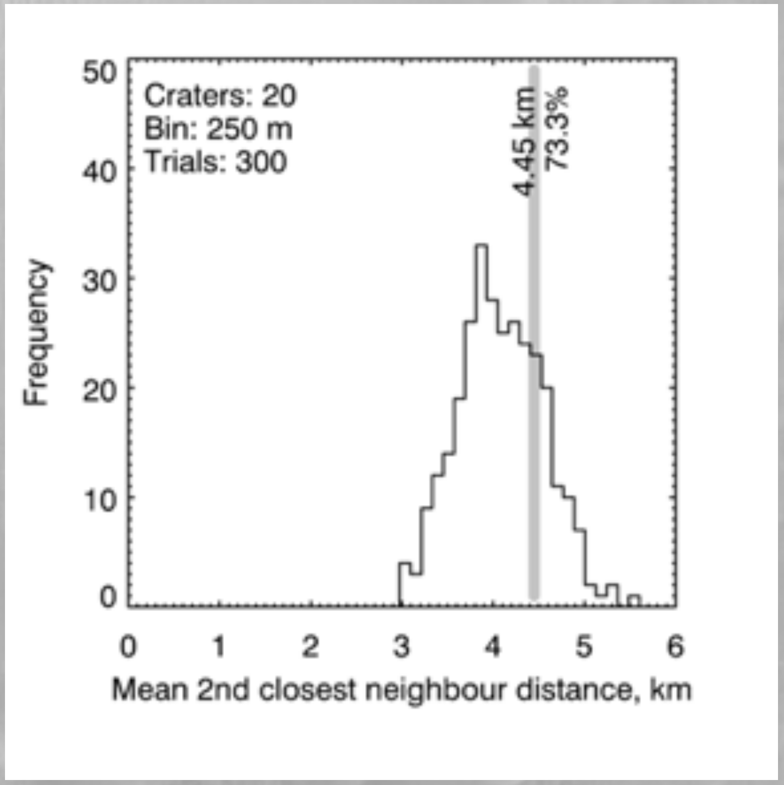


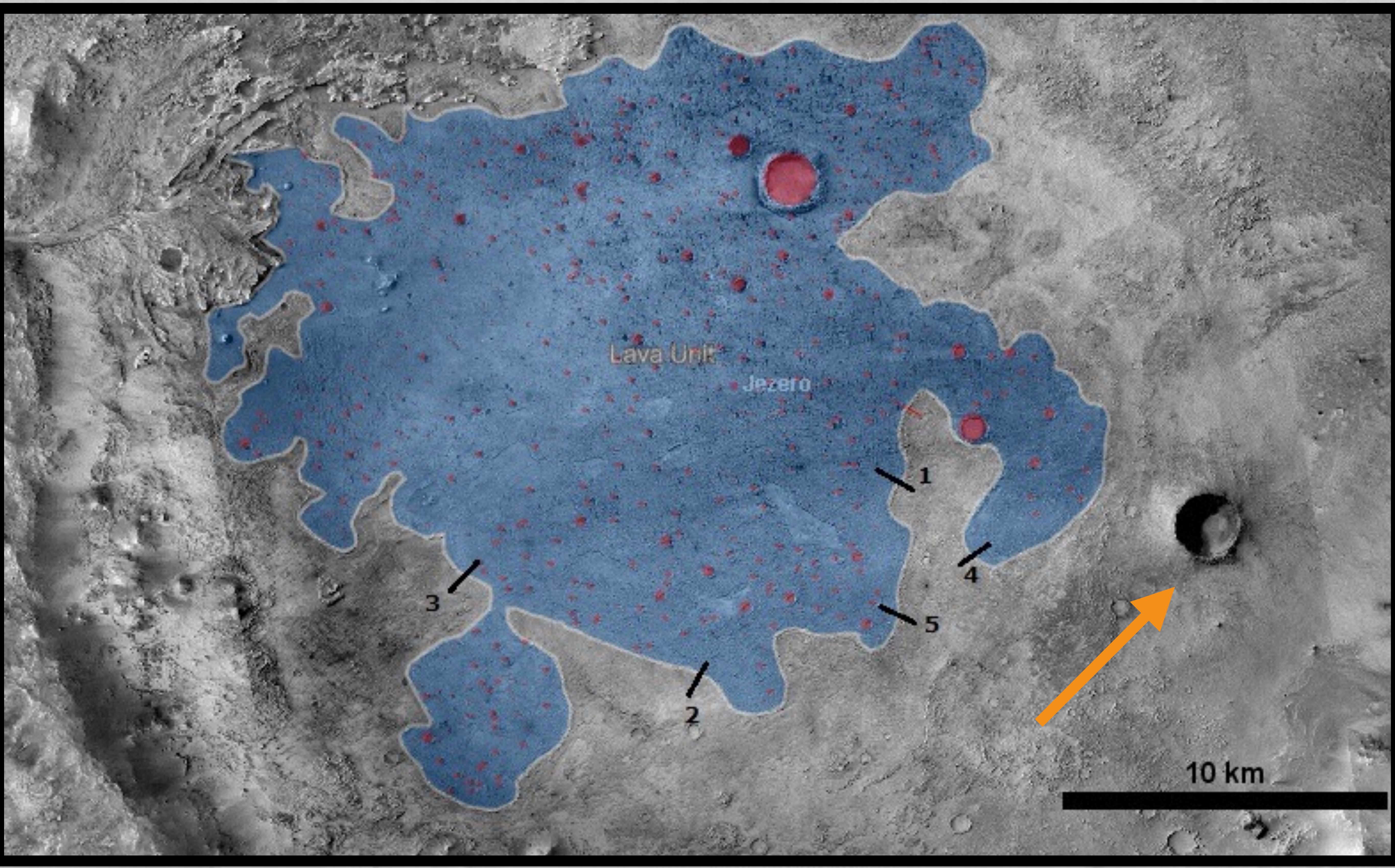








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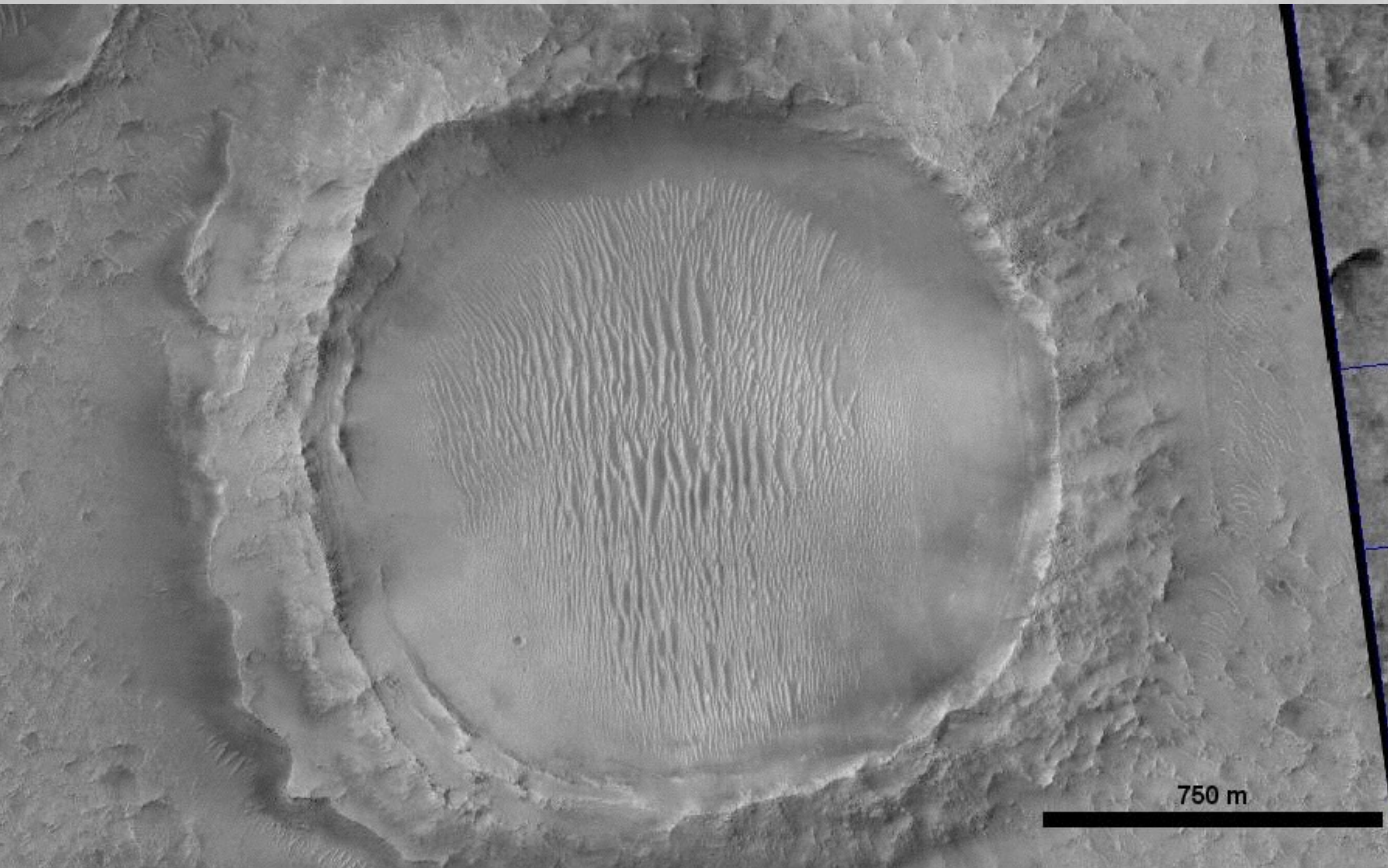
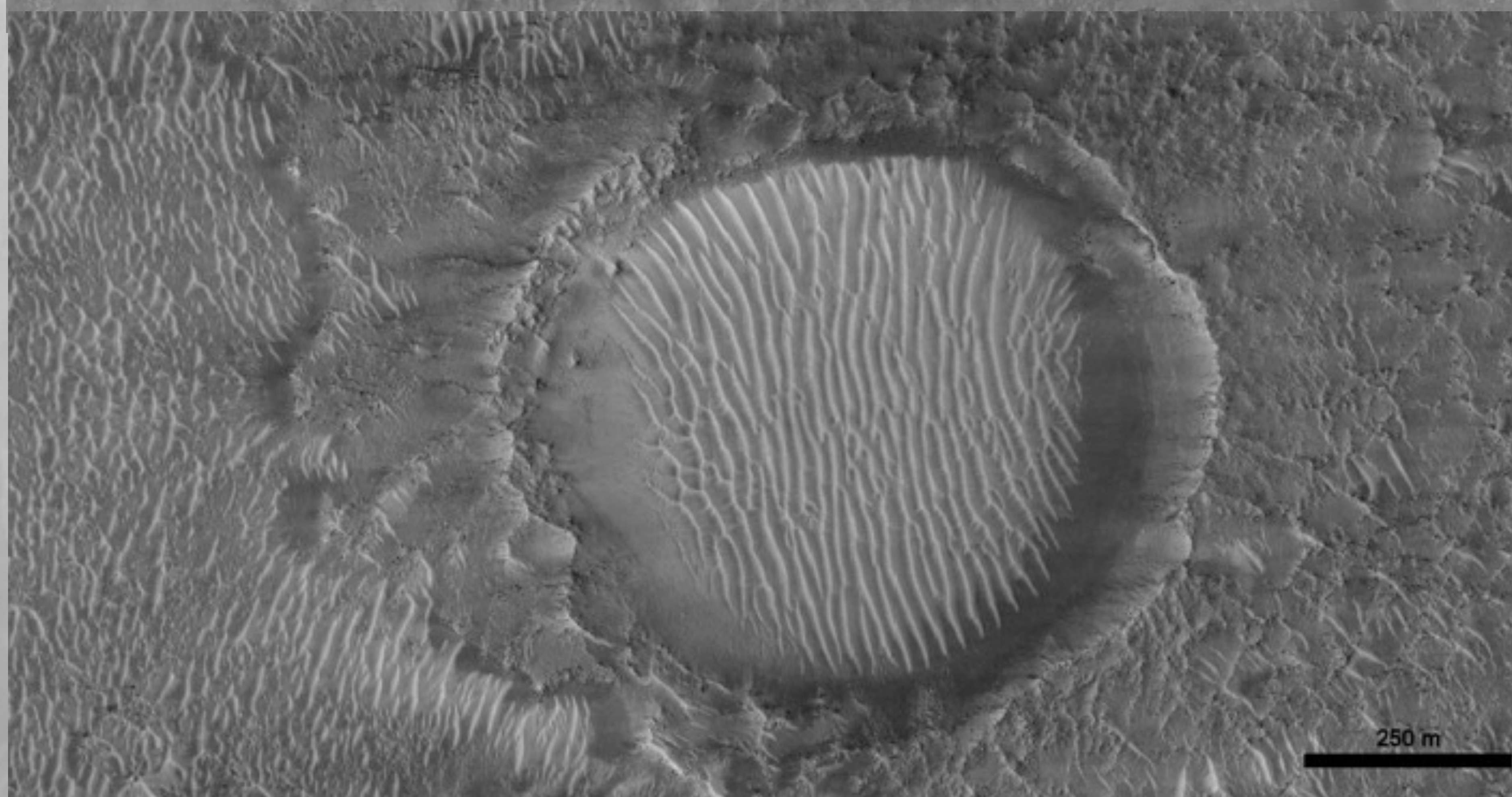
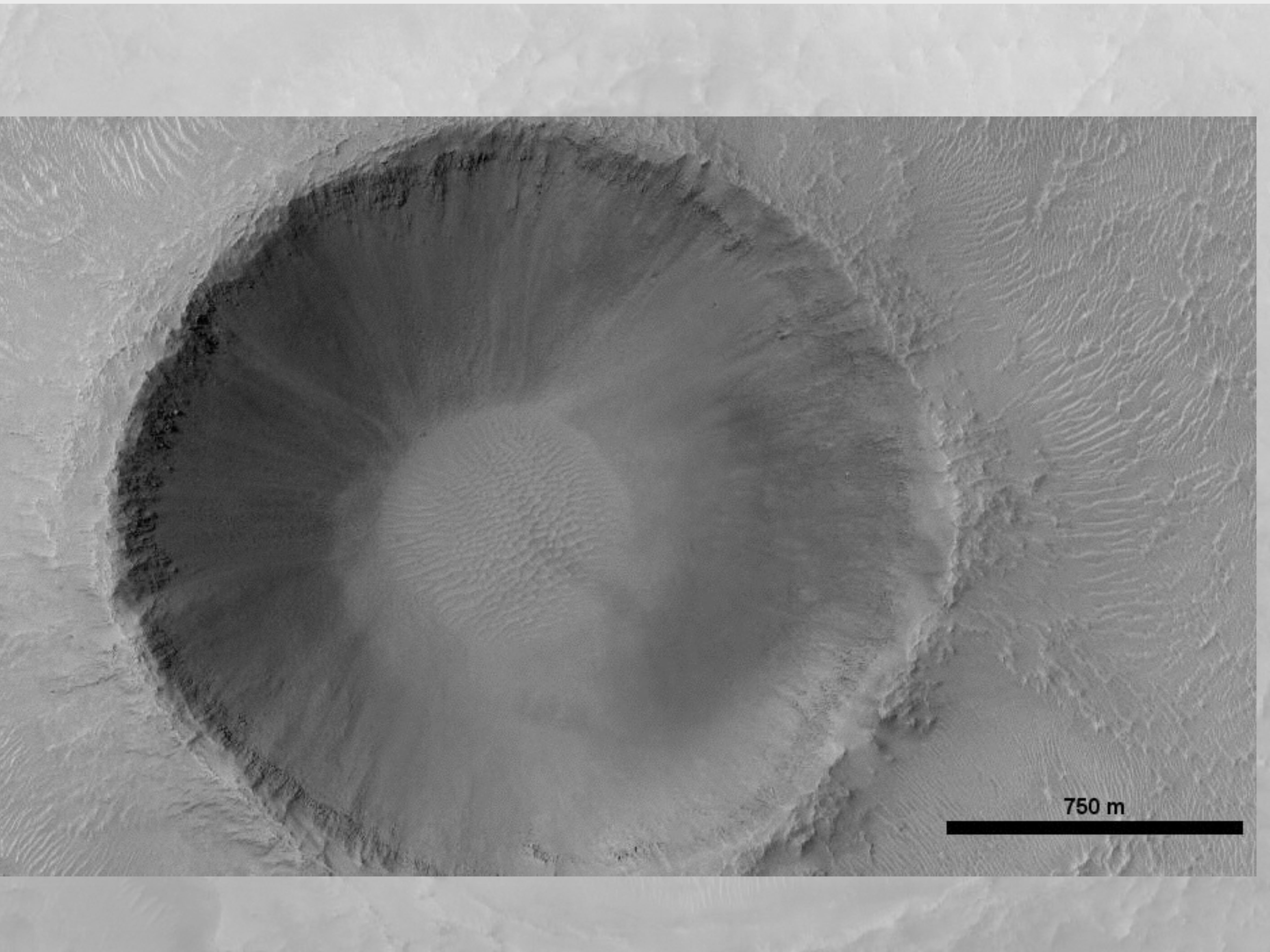
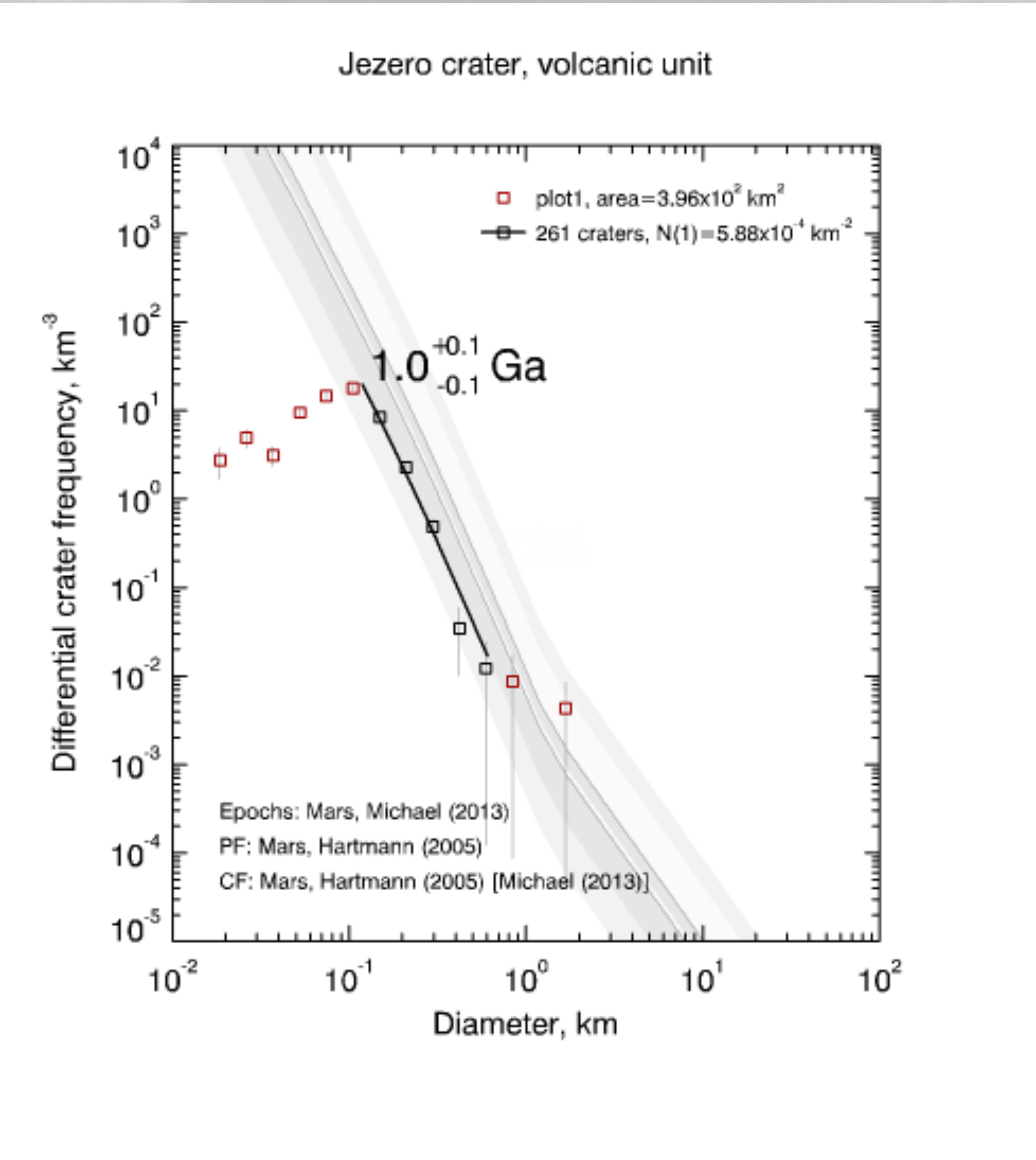

750 m


250 m

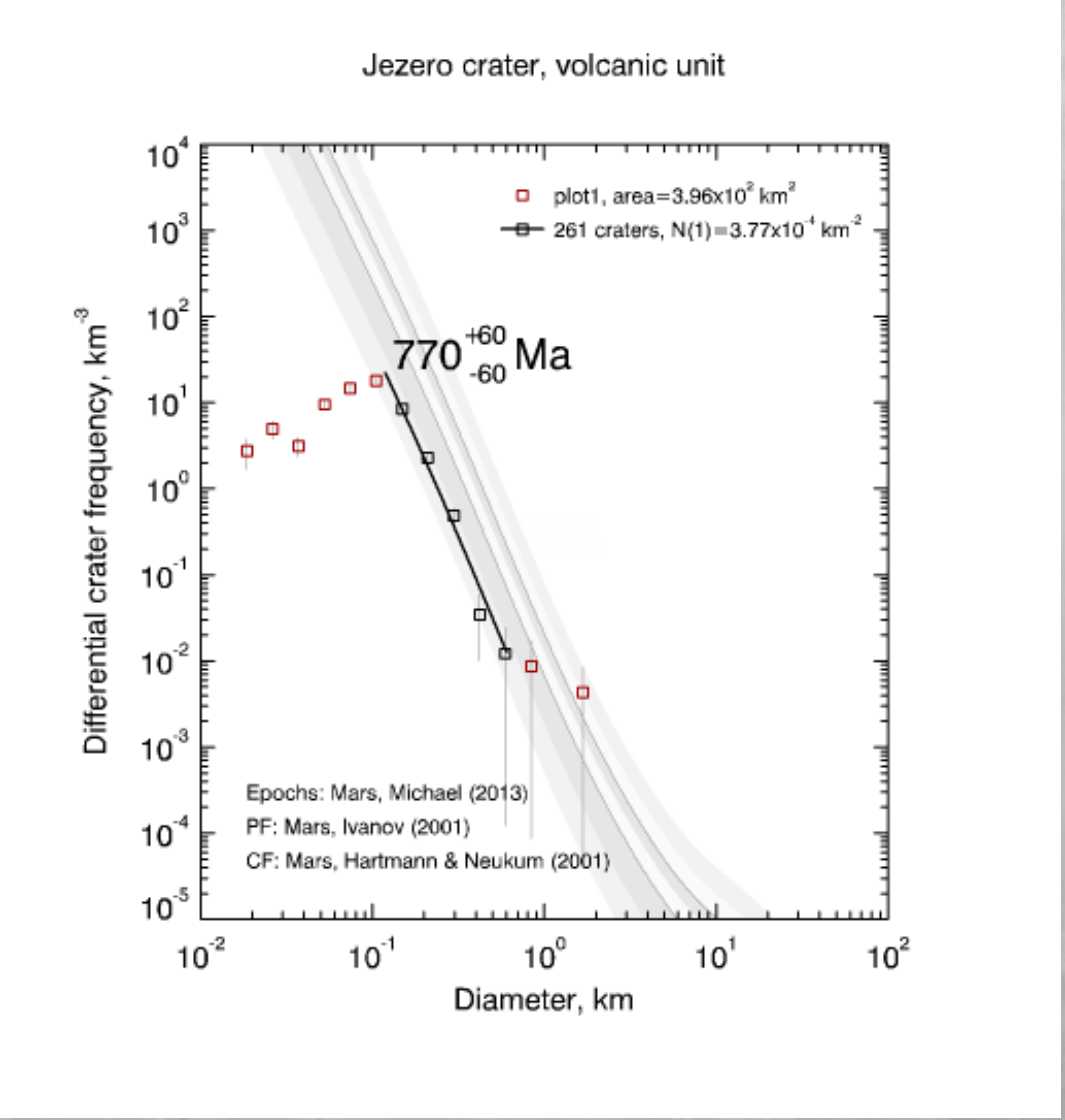

250 m


750 m

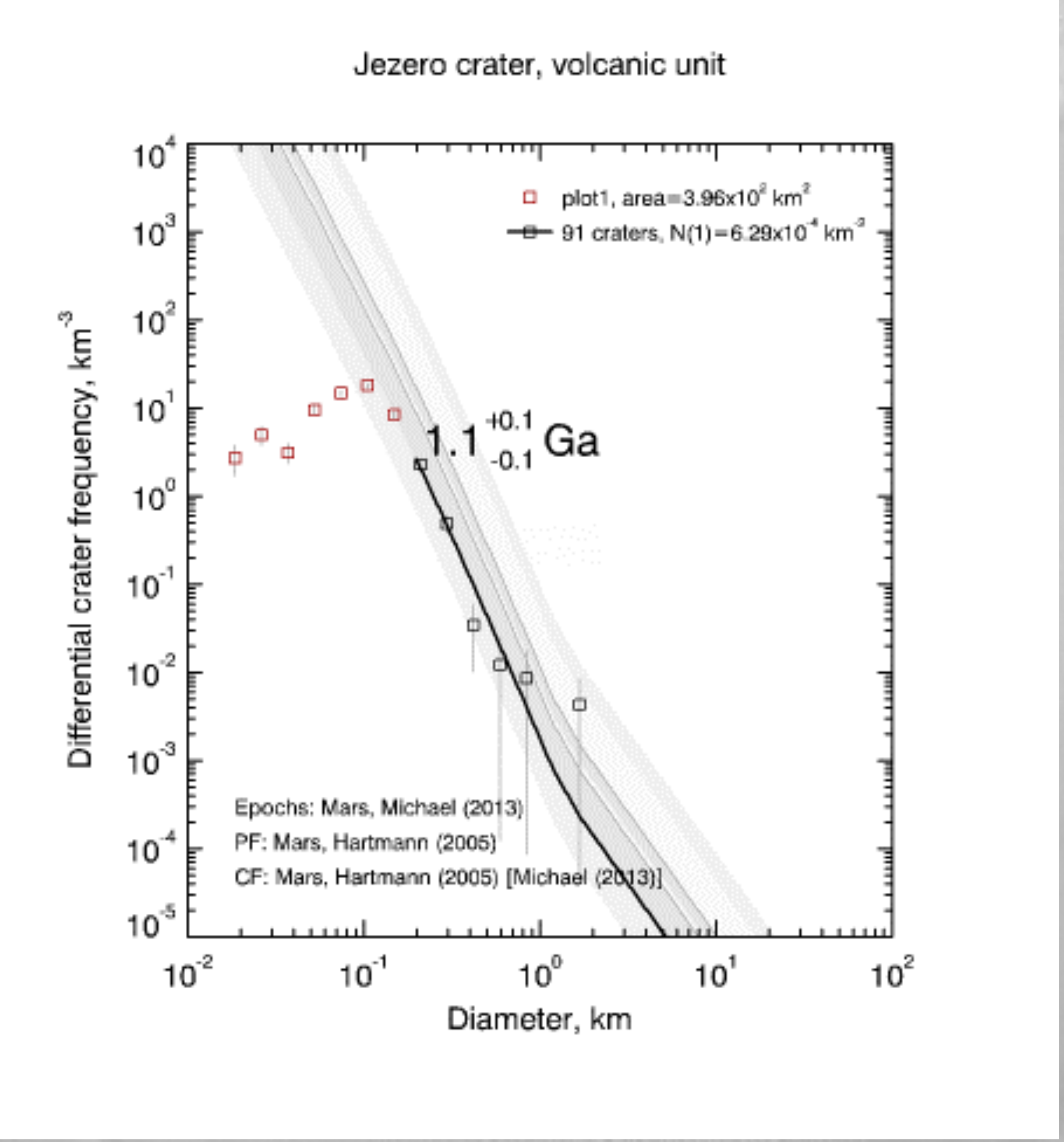
Age derivation (Hartmann)



Age derivation (Neukum)



Why the discrepancy to Schon et al ?



300 Ma of discrepancy must be chalked up to the possibility of human error introduced by any crater counting study (e.g. Robbins et al., Icarus, 2014)

Conclusion

We argue that the dark-toned unit is thin so the largest craters may predate the unit and should not weigh heavily in the age determination.

Doing this results in Hartmann ages from 1.0 Ga +/- 0.1 Ma (Middle Amazonian, us) to 1.4 Ga (Early Amazonian, Schon).

IF this is true it means this surface is right at a time when there is large uncertainty of the cratering chronology and with good statistics -> a sample from here would be great for improving calibration.